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A Scalable Approach to High-Impact Tutoring for Young Readers: Results of a Randomized Controlled Trial

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Introduction

A primary goal of early elementary education is developing literacy skills (Fiester, 2010), yet two-thirds of US students will not be proficient readers by the time they reach 4th grade (U.S. Department of Education, 2022). The COVID-19 pandemic rallied the nation around the need to catch students up and to address "lost learning." However, even prior to the pandemic, millions of students across the country were not learning to read through classroom instruction alone (Lesnick et al., 2010).

Decades of evidence point to an effective intervention to help struggling readers: one-on-one or small group tutoring (Neitzel et al., 2022). Research consistently demonstrates that tutoring interventions have substantial positive effects on student learning—often translating to an additional 3-15 months of schooling (Nickow et al., 2020). The evidence base for early elementary tutoring in reading is particularly strong, although the effectiveness of individual programs can vary greatly (Heinrich et al., 2014; Nickow et al., 2020; Wanzek et al., 2016).

The documented variations in tutoring-program effectiveness may be, in part, due to the wide range of interventions that people refer to as tutoring. While some tutoring may take the form of homework help and drop-in support (Robinson et al., 2022), reading tutoring interventions that provide students with one-on-one, personalized reading instruction consistently demonstrate the largest improvements in reading achievement (Cavanaugh et al., 2004; Gersten et al., 2020; Neitzel et al., 2022; Slavin et al., 2011; Wanzek et al., 2018; Wanzek et al., 2016). Specific programs may differ in delivery or approaches, but most effective reading tutoring programs involve students meeting for 20-60-minute sessions several times a week with a consistent educator and use evidence-based reading curricula (Galuschka et al., 2014; Wanzek et al., 2018; Wanzek et al., 2016). These features align with the definition of "high-impact" tutoring, which involves substantial time each week spent in required tutoring; sustained and strong relationships between students and their tutors; close monitoring of student knowledge and skills; alignment with school curriculum; and oversight of tutors to assure quality interactions (Robinson & Loeb, 2021).

High-impact tutoring programs drive the large effect sizes cited in the literature, but they can be hard to scale and require substantial resources to implement (Thomas, L.G., et al., 2022). Successful tutoring programs often require dedicated tutoring blocks within the school schedule and cost, at a minimum, over $1000 per student (e.g., Guryan et al., 2021; Sirinides et al., 2018). Given the large expected effect sizes, high-impact tutoring is quite cost-effective at improving student learning outcomes (Guryan et al., 2021). However, the urgent and growing demand for high-impact tutoring programs to build children's reading skills (U.S. Office of the Press Secretary, 2022) and common implementation issues (Carbonari et al., 2022), may prompt district leaders to search for even lower-cost programs that fit within existing school schedules.

In this brief, we present results from a randomized controlled trial of an early elementary reading tutoring program that has been designed to be affordable at scale. During the 2021-22 school year, over eight hundred kindergarten students in a large Southeastern school district were randomly assigned to receive supplementary tutoring with the Chapter One program. The program embeds part-time tutors into the classroom to provide short bursts of instruction to individual students each week over the course of the school

year. The consistent presence of the tutors allows them to build strong relationships with students and meet students' individual needs at the moment they might most benefit from personalized instruction.

We found that students who participated in Chapter One's program were over two times more likely to reach the target reading stage by the end of kindergarten (a 120% increase). The positive findings at the end of the first year of implementation provide promising evidence of an affordable and sustainable approach for delivering one-on-one personalized reading tutoring at scale.

Leveraging close relationships and technology to support early readers

Although reading tutoring is not a novel approach to improving literacy, the evaluation of the Chapter One program is among the first to provide evidence that early elementary students can benefit from frequent, short bursts of reading instruction from consistent tutors embedded in the classroom. The program leverages technology and the close relationship tutors build with their students to personalize instruction, dosage, and session length to meet the individual needs of each child to develop a strong foundation in phonics and build reading fluency.

Chapter One uses a "push-in" model that provides districts with part-time tutors, or Early Literacy Interventionists (ELIs), who meet with students one-on-one in the back of the classroom over the course of a school year. One ELI serves multiple classrooms in the school, and tutors individual students in 5-7 minute increment sessions during blocks of reading instruction or other opportune moments. At the end of each session, the departing student brings the next student to the ELI to minimize interruptions of classroom instruction.

These short sessions account for young students' short attention spans and allow for each session to focus on a progression of discrete skills (Ehri et al., 2001). Specifically, students progress through stages of phonics development, learning to segment and blend short and long vowel sounds, learn sight words, and learn strategies to fluently read both decodable and noncontrolled texts. The curriculum draws on a strong evidence base on teaching young children to read (Ehri et al., 2001) and is designed to match learning and instruction with a child's developmental level (Vygotsky, 1980).

As evidence of the latter, the length of each session and the number of sessions per week vary for each student based on need and rate of progress. For instance, students who are making adequate progress may only meet with their tutor once or twice a week, whereas students who the tutors identify as in need of more support may meet daily for periods of time.

To provide this tailored support, the Chapter One program leverages technology to support instruction, as well as to direct student independent practice. ELIs follow a digital curriculum to conduct each session, which facilitates the assessment and tracking of student performance over time. In addition to using the technology in one-on-one sessions, students spend 15 minutes each day independently practicing using Chapter One's software on program-provided tablets. All assessments sync in real time with individual student tablets, so that when a student uses the practice software after the one-on-one session, they practice items that are precisely aligned to their most recent tutored instruction. ELIs also regularly meet with teachers, reading coaches, and principals to review online reports of student progress.

The structured curriculum and technological support allow for a wide range of people to serve as ELIs. Some ELIs are former classroom teachers, however most do not have a teaching certification. All ELIs have earned at least a Bachelor's degree and undergo an extensive series of online training courses with associated

assessments that they must pass to proceed in the training plan. ELIs are compensated substantially above minimum wage and also receive ongoing support and development over the term of their employment.

The program currently costs school districts $375 per student, which includes the ELI, student technology (tablets - Kindle Fires), background check, training time, Chromebook for the ELI, reinforcement materials for the ELI vetted to align with the model, and indirect costs for implementing the program. In implementations that involve over 5,000 students, the district is also asked to fund the cost of district-wide managers which increases the cost per student to approximately $450. Even in large implementations, this cost is substantially lower than the vast majority of other tutoring programs and does not require districts to coordinate complicated logistical arrangements.

Methods

Study Details

During the 2021-22 school year, Chapter One partnered with a large school district in the Southeastern US to conduct a randomized controlled trial of the program with early elementary students. Fifty-six percent of students' families in the district qualify for free and reduced priced lunch (FRPL) and 12.6% of students are English Learners (ELs).

The district identified 49 kindergarten classes across 13 schools to participate in the evaluation. Tutoring by Chapter One started in early November 2021 in certain schools and was rolled out to all classrooms over the course of the next couple of months. The first year of the program lasted through the end of the kindergarten school year, in May 2022. Students who remained in the district were expected to receive Chapter One tutoring in first grade during the 2022-23 school year, as well.

Our evaluation explores the effect of receiving Chapter One tutoring in kindergarten and first grade on reading proficiency through early elementary school. In this article we present the results from year one of the study, in which we assess the intermediate impact of Chapter One tutoring on kindergarten students' reading development. Specifically, did students receiving Chapter One tutoring in kindergarten reach the program's targeted Reading Foundation Stage (stage 4) at the end of kindergarten? We will continue to assess student progress through the end of third grade to measure the long-term impact of the intervention.

Sample and Randomization

The study consisted of 818 kindergarten students in 13 schools. Panel A of Table 1 provides information on the demographics of the students in the RCT sample. We conducted a student-level randomization stratified by classroom. Specifically, within each kindergarten classroom (N = 49), we randomly assigned 50% of the students to the treatment group (i.e., to receive Chapter One tutoring; N = 420) and 50% to the control group (i.e., to receive business-as-usual instruction; N = 398).

Table 1. Sample Descriptive Statistics and Balance Test

	Panel A: Overall			Panel B: Treatment			Panel C: Control			Diff	SE	
	Mean	SD	N	Mean	SD	N	Mean	SD	N			
Student Demographics:												
White	0.04		818	0.02		420	0.07		398	-0.05	0.01	***
Black	0.72		818	0.73		420	0.71		398	0.02	0.03	
Hispanic	0.21		818	0.22		420	0.19		398	0.02	0.02	
Other Race	0.03		818	0.03		420	0.03		398	0.00	0.01	
Female	0.47		818	0.50		420	0.44		398	0.07	0.04	+
English-Language Learner	0.28		818	0.31		420	0.25		398	0.06	0.02	*
Special Education	0.11		818	0.11		420	0.11		398	0.00	0.02	
Student Baseline Achievement:												
FLKRS Scaled Score	452.75	93.78	739	445.31	90.63	381	460.66	96.52	358	-15.24	6.59	*
FLKRS Standardized Score	0.01	1.01	739	-0.07	0.97	381	0.09	1.03	358	-0.16	0.07	*
FLKRS Imputed Scaled Score	452.75	89.13	818	446.00	86.33	420	459.86	91.56	398	-14.65	5.99	*
FLKRS Imputed Standardized Score	0.00	1.00	818	-0.08	0.97	420	0.08	1.03	398	-0.16	0.07	*
Indicator for Imputed FLKRS	0.10		818	0.09		420	0.10		398	-0.01	0.02	

Notes: FLKRS is a screening instrument, known as the Florida Kindergarten Readiness Screener (FLKRS), that must be administered to all public school kindergarten students within the first 30 days of each school year.
*** p<0.01, ** p<0.05, * p<0.10.

Data

We collected administrative data from the school district and Chapter One, including data on gender, race/ethnicity, ELL indicators, and whether students qualify for special education services (SPED). We also collected demographic information on teachers, presented in Table 2.

Table 2. Teacher Demographics

	Mean	SD	N
Female	0.80		49
White	0.32		49
Black	0.41		49
Hispanic	0.13		49
Total Experience	13.79	9.83	49
Experience in FL	11.69	8.68	49
Experience in District	11.18	8.66	49

As a proxy for baseline reading skill, we use the district's administration of the Florida Kindergarten Readiness Screener (FLKRS), which was the Renaissance Star Early Literacy measure in Fall of 2021. The FLKRS must be administered to all public school kindergarten students within the first 30 days of each school year. The literacy classifications for the scores are as follows: Early Emergent Reader (300 - 387), Late Emergent Reader (488 - 674), Transitional Reader (675 - 774), and Probable Reader (775 - 900).

The primary outcome for the present study is a binary indicator for whether students reached Reading Foundation Stage (RFS) 4 or higher at the end of their kindergarten year. The Chapter One program follows a child's progression through six Reading Foundation Stages, and then Mastery Stages that align with the Fountas & Pinnell Reading Levels. Upon mastering the Reading Foundation Stages, students continue to work with ELIs to practice oral reading and adaptive phonics content. Reading Foundation Stage 4 entails segmenting and blending CVC words (consonant-vowel-consonant, such as "cat and hot") and recognizing 30 common words by sight. Students who master Reading Foundation Stage 4 have learned the sounds for short vowels and most consonants.

In addition to the binary Reading Foundation Stage 4 or higher indicator, we assessed the differences in students' average Stage level as well as their Reading Foundations Growth scores (i.e., their growth from the beginning of the year to the end of the year). We also collected and standardized Oral Reading Fluency (ORF) scores and data on students' District Reading Level tests (when available). These latter two assessments are not the primary outcomes for kindergarten students but will be key outcomes in future analyses.

Analysis

We preregistered our study design, hypotheses, and analytic plan on the Social Science Registry prior to conducting the primary analysis (see: https://www.socialscienceregistry.org/trials/10810/history/169581). We use the following model to evaluate the difference between the treatment and control groups:

$$Y_{ijk} = \alpha + \beta_1 Treatment_i + \beta_2 FLKRS_i + \pi \boldsymbol{X}_i + \gamma T_j + \varepsilon$$

where *Y* is the outcome for student *i* in classroom *j* in school *k*; *Treatment$_i$* is an indicator whether student *i* was assigned to ChapterOne; *FLKRS$_i$* is a student's beginning of the year FLKRS score (included as a control for

baseline achievement); X_i is a vector of student-level characteristics (i.e., indicators for gender, race, ELL, SPED); T_j is a teacher fixed effect; and ε is an error term.

We calculated the minimum detectable effect size (MDES) using https://powerupr.shinyapps.io/index/. Based on conservative assumptions (e.g., 33% of the variation is explained by covariates and baseline achievement), we have 80% power to detect an MDES of 0.164-standard deviations.

We also conducted exploratory analyses that study the heterogeneity of the treatment effects by pre-intervention characteristics and student demographics. Specifically, we looked at outcomes for students with different reading skills at the beginning of kindergarten, comparing Early Emergent Readers to students who scored as Late Emergent Readers or greater.

Results

Descriptive statistics and Balance Check

Table 1 provides details on the sample descriptive statistics and how the two conditions compared at baseline. There appear to be slight differences between the two conditions. The treatment group is slightly less likely to be White, more likely to be female, and more likely to be classified as ELLs. The treatment group also has slightly lower initial FLKRS baseline scores than the control group. We control for these features in our final model to account for any bias the imbalance might introduce in our estimates.

We retained all students in our final analytic sample, however we did record attrition during the first year of the study. All treated individuals have start dates, with the exception of two students. One of those students withdrew from school and the other was moved to an Autism Spectrum Disorder classroom before their original class began the treatment. An additional 25 students withdrew from the participating schools before the end of the program.

Due to attrition and students missing tests, there is some missingness in the data. At baseline, 79 students are missing FLKRS scores. For all analyses, we provide two sets of results: (1) excluding students who do not have FLKRS baseline data and (2) imputing missing FLKRS scores with the sample mean. At the end of the year, 74 students are missing end-of-year RFS data and 82 students are missing Oral Reading Fluency assessments. Additionally, only 274 kindergarten students in the sample took the District Reading Level assessment. Table 3 shows that attrition from the sample due to missing data is equal across conditions.

Table 3. Attrition Analysis on Outcome Measures.

	Panel A: Attrition (End of the School Year Outcomes)			
	Reading Foundations	Reading Foundations Growth	Oral Reading Fluency (ORF)	District Reading Level
Treatment	0.0188	0.0196	0.0151	0.00520
	(0.0207)	(0.0199)	(0.0200)	(0.0105)
Constant	0.900***	0.919***	0.892***	0.332***
	(0.0106)	(0.0102)	(0.0102)	(0.00537)
Observations	818	818	818	818
R-squared	0.073	0.058	0.075	0.921

Notes: Standard errors clustered at the teacher-level in parentheses. Includes teacher fixed-effects. *** p<0.01, ** p<0.05, * p<0.10.

Reading Foundation Stage Results

We present our primary results in Table 4. As Figure 1 illustrates, students who received Chapter One during kindergarten were 38.1-percentage points more likely to reach RFS Level 4 or higher by the end of kindergarten (69.9%) than students in the control group (31.8%). Looking at Table 5, we see that this increase stems from students in the treatment group being, on average, about one Reading Foundation Stage ahead of students in the control group. Table 5 shows that the average student in the control group is at a Reading Foundation Stage 3 (M = 2.96) whereas students in the treatment group are at a Stage 4 (M = 3.97). We see that translates to an additional growth of 1.12 Reading Foundation Stages from the beginning of the program to the end of the school year.

Table 4. The Effect of Chapter One's Program on Achieving a Reading Foundation Stage 4 or Higher

	(1)	(2)	(3)	(4)
Treatment	0.363***	0.358***	0.385***	0.381***
	(0.0432)	(0.0434)	(0.0428)	(0.0419)
Observations	744	744	744	744
R-squared	0.132	0.294	0.385	0.395
Control Group Average		0.318		
FLKRS Control	No	Yes	Yes	Yes
Imputed FLKRS	No	No	Yes	Yes
Student Controls	No	No	No	Yes
Teacher FE's	No	Yes	Yes	Yes

Notes: Student-level controls include dummy variables for female, white (omitted category), black, Hispanic, other race, English Language Learner, and special education. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Figure 1. The likelihood of achieving Reading Foundation Stage 4 or higher by the end of kindergarten by condition assignment
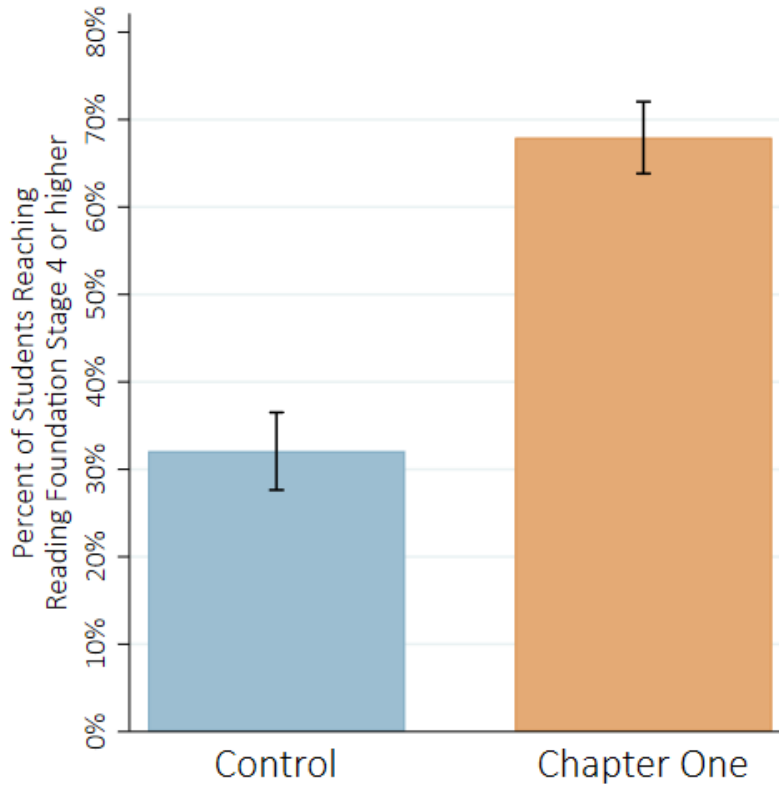

Table 5. The Effect of Chapter One's Tutoring Program on Reading Foundation Stage Levels

	Reading Foundation Stage	Reading Foundation Growth
Treatment	1.008***	1.115***
	(0.0878)	(0.0813)
Observations	744	760
R-squared	0.503	0.444
Control Group Average	2.961	1.074
FLKRS Control	Yes	Yes
Imputed FLKRS	Yes	Yes
Student Controls	Yes	Yes
Teacher FE's	Yes	Yes

Notes: Standard errors clustered at the teacher-level in parentheses. Student-level controls include dummy variables for female, white (omitted category), black, Hispanic, other race, English Language Learner, and special education. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Other Reading Assessment Results

Table 6 shows the impact of being assigned to Chapter One on district assessments. Students receiving Chapter One scored, on average, 0.23-standard deviations higher on Oral Reading Fluency assessments. Not all kindergarten students took the District Reading Level assessment but, among those that did, there is some evidence that students receiving Chapter One scored higher. The estimates are positive and marginally statistically significant.

Table 6. The Effect of Chapter One's Tutoring Program on Other Reading Achievement Outcomes

	Oral Reading Fluency (ORF)	District Reading Level
Treatment	0.225***	0.307*
	(0.0650)	(0.176)
Observations	736	274
R-squared	0.427	0.507
Control Group Average	-0.064	3.508
FLKRS Control	Yes	Yes
Imputed FLKRS	Yes	Yes
Student Controls	Yes	Yes
Teacher FE's	Yes	Yes

Notes: Standard errors clustered at the teacher-level in parentheses. Student-level controls include dummy variables for female, white (omitted category), black, Hispanic, other race, English Language Learner, and special education. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Heterogeneity Analysis

We conducted a heterogeneity analysis to understand the extent to which students' baseline reading abilities impacted the impact of Chapter One. Panel A shows the effect Chapter One had on kindergarten students who were classified as Early Emergent Readers at the beginning of the year. Panel B shows the effect of the program on kindergarten students who had more advanced reading abilities at the outset of the program. Overall, we see that the treatment effect estimates are largely consistent across the two ability groups. For instance, Early Emergent Readers who received the Chapter One program were 37-pp more likely to reach Reading Foundation Stage 4 or higher and more advanced readers were 44-pp more likely to reach the target stage. Because students are making equivalent gains no matter their baseline ability levels, those scoring higher at the outset ultimately achieve more advanced reading levels: 89% of students who were at least Late Emergent Readers reached Stage 4, compared to 60.9% of Early Emergent Readers.

Table 7. Heterogeneity Analysis by Literacy Classification at Beginning of School Year

	Panel A: Early Emergent Readers				Panel B: Late Emergent Readers or More Advanced			
	Achieve Stage 4 or Higher	Reading Foundation Stage	Reading Foundation Growth	Oral Reading Fluency	Achieve Stage 4 or Higher	Reading Foundation Stage	Reading Foundation Growth	Oral Reading Fluency
Treatment	0.373***	1.051***	1.238***	0.205***	0.437***	1.018***	1.088***	0.304**
	(0.0447)	(0.0965)	(0.0845)	(0.0717)	(0.0682)	(0.155)	(0.168)	(0.132)
Observations	480	480	493	474	262	262	264	260
R-squared	0.400	0.512	0.537	0.343	0.473	0.518	0.513	0.393
Control Group Average	0.236	2.627	0.929	-0.395	0.449	3.493	1.305	0.457
FLKRS Control (imputed)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Student-level Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Teacher FE's	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Over 70% of the students were classified as "Early Emergent" readers which is the lowest level. According to the definition, "an Early Emergent Reader is beginning to understand that printed text has meaning. The student is learning that reading involves printed words and sentences, and that print flows from left to right and from the top to the bottom of the page. The student is also beginning to identify colors, shapes, numbers, and letters." Student-level controls include dummy variables for female, white (omitted category), black, Hispanic, other race, English Language Learner, and special education. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

Conclusion

Chapter One's unique combination of short bursts of 1:1 instruction by trained staff, together with independent practice on digital devices precisely synched to the 1:1 instruction, delivers a program that is highly affordable and scalable. The program is also likely to be less obtrusive to classroom instruction than tutoring programs that pull out students for greater amounts of time. The program aligns with beginning reading curricula and is provided on a turnkey basis that appears to be easily implemented by districts and schools.

We find that implementing this program in kindergarten can dramatically improve the reading ability of students at the end of the year. Almost 70% of students who received Chapter One tutoring reached the goal for kindergarten students, Reading Foundation Stage 4, by the end of the year. Comparatively, only 32% of students in the control group reached Stage 4. By reaching Stage 4, where the students can segment and blend CVC words, these students can "hit the ground running" in their reading instruction at the beginning of first grade. Students who enter first grade unable to decode CVC words may be at risk of failing to be fluent readers at the end of first grade.

We will continue to track students' progress through third grade, but the results from the first year of the evaluation are encouraging. Given the low-cost of the program and the ease of incorporating the program into the school day, using classroom-based tutors to deliver short bursts of reading instruction, supported by technology that helps tutors address each student's specific needs, may be a promising approach for making early reading tutoring programs sustainable and affordable.

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